

Box 3.2.2 Comparison of Sampling Protocols Used for SCECAP and Other SCDHEC Monitoring and Reporting Activities

A subset of sites sampled each year for SCECAP (Core Sites) is also sampled monthly by SCDHEC for a suite of water quality parameters used in Clean Water Act 305(b) reporting activities. This provides an opportunity to compare how the one-time SCECAP sampling approach compares with routine water quality sampling conducted by SCDHEC, using both the water quality criteria established for SCECAP and other water quality criteria used by SCDHEC for their 305(b) assessment.

12-Month Versus One-Time Assessments

Because the SCECAP Integrated Water Quality Score (IWQS) was developed based on a one-time visit at each site, it was necessary to devise a comparative approach for sample observations collected throughout the year at the same stations. To calculate a comparable IWQS for the monthly data, the general assessment approach used by SCDHEC for Clean Water Act reporting activities (SCDHEC, 2006) was adapted for application using SCECAP IWQS parameters and thresholds. This required scoring the monthly data obtained for the six water quality parameters as shown in Table A. The IWQS then was calculated following the single sample procedure (Van Dolah *et al.* 2004a).

Table A: Criteria used to code each parameter in order to translate SCDHEC 305(b) reporting methodology into the 12-month IWQS.

Parameter	SCDHEC 305(b) Parameter Codes As:		
	Good	Fair	Poor
Dissolved Oxygen	< 2 samples	≥ 2 samples	≥ 2 sample exceeded
pH	exceeded SCECAP	exceeded SCECAP	SCECAP fair threshold
Fecal Coliform	fair threshold	fair threshold	and ≥ 1 was poor
Total Nitrogen	< 3 samples	≥ 3 samples	≥ 3 samples exceeded
Total Phosphorus	exceeded SCECAP	exceeded SCECAP	SCECAP fair threshold
Chlorophyll- <i>a</i>	fair threshold	fair threshold	and ≥ 1 was poor

The one-time and 12-month assessments using the SCECAP IWQS thresholds produced very different conclusions (Figure A). Compared with the one-time assessment, the 12-month assessment indicates a considerably lower percentage of estuarine habitat is in good condition and a higher percentage is in fair or poor condition. Total phosphorus had the greatest influence on the differences in both the tidal creek and open water habitats, primarily based on the large number of individual sites classified as poor in the 12-month assessment as compared to the one-time assessment (Table B). In tidal creeks, chlorophyll-*a* and, to a lesser extent, fecal coliform bacteria also contributed to the overall difference in the classification of individual sites. Fecal coliform bacteria may also account for some of the differences in the open water habitat results.

SCECAP IWQS Versus SCDHEC 305(b) Reporting

For a stricter comparison of the SCECAP IWQS and the SCDHEC 305b reporting, which includes additional parameters not used in the SCECAP IWQS, a different approach was required. Parameters considered in the 305(b) reporting include dissolved oxygen, pH, fecal coliform bacteria, turbidity,

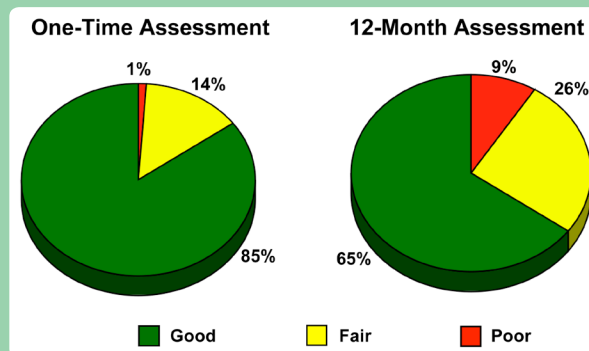


Figure A. Percent of the state's estuarine habitat that codes as good, fair, or poor based on the one-time SCECAP integrated water quality score and the 12-month integrated water quality score.

Table B. Percent of open water and tidal creek core sites classified as good, fair, or poor based on 12-month and one-time assessments for each parameter.

Measure	Assessment	Open Water			Tidal Creek		
		Poor	Fair	Good	Poor	Fair	Good
IWQS	12-Month	6	23	71	23	37	40
	One-time	0	13	77	3	20	77
Dissolved Oxygen	12-Month	0	3	97	3	23	74
	One-time	3	6	91	0	20	80
pH	12-Month	17	8	75	18	5	77
	One-time	0	15	85	0	11	89
Fecal Coliform	12-Month	10	26	64	7	33	60
	One-time	0	19	81	7	23	70
Total Nitrogen	12-Month	3	10	87	13	0	87
	One-time	0	14	86	7	7	84
Total Phosphorous	12-Month	45	3	52	33	10	57
	One-time	7	16	77	3	50	47
Chlorophyll- <i>a</i>	12-Month	6	10	84	30	20	50
	One-time	0	6	94	13	17	70

ammonia, cadmium, chromium, copper, lead, mercury, nickel, and zinc, but the SCECAP IWQS only includes the first three parameters. The 305(b) report provides results on fecal coliform bacteria related to human health issues in a separate use category (recreational use) from the other parameters whose thresholds are set to protect aquatic organisms (aquatic life use). Therefore, the comparison of the SCECAP IWQS and the 305(b) report is limited to only two categories: *good* for both uses, or *other* (i.e., fair or poor for either or both uses). Additionally, the 305b report does not evaluate tidal creeks and open water habitats separately. Therefore, the two habitat types were combined for this comparison.

The SCDHEC 305(b) assessment results are in closer agreement with the one-time SCECAP data than the 12-month SCECAP IWQS despite using a very different set of parameters and employing different thresholds (Figure B). However, given the differences in assessment methods, parameters, and threshold values, this apparent degree of agreement may be coincidental.

In summary, it appears that the one-time assessment of state water quality condition used for SCECAP may not be as sensitive to detecting water quality impairment as a year-round sampling approach. It is important to note that state water quality criteria have not been established for nutrients and chlorophyll-*a* (3 of the 6 components of the SCECAP IWQS), so the differences may not be of great concern, especially considering that much of the difference is related to exceedances of the SCECAP criteria for phosphorus. Based on the lack of any significant relationship between phosphorus concentrations and chlorophyll-*a* concentrations, phosphorus may not be appropriate to include in future integrated water quality indices. SCDHEC and SCDNR staff will be reviewing both the SCECAP IWQS thresholds and list of parameters included on a periodic basis.

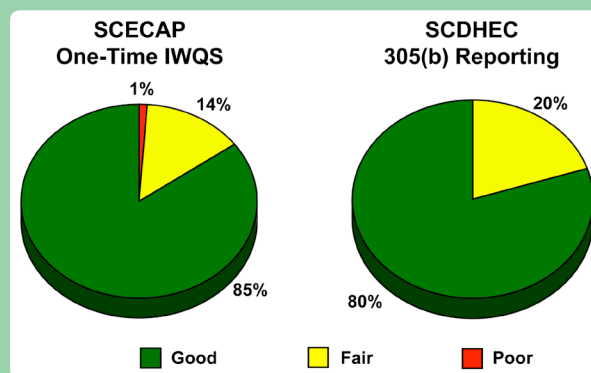


Figure B. Percent of the state's estuarine habitat that codes as good, fair, or poor based on the one-time SCECAP integrated water quality score and the SCDHEC 305(b) reporting methodology.